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the last observation (1876) he says, "It can hardly be called a planetary nebula."

The star *n.p.*, the centre, is estimated as of 13th–14th magnitude, and the other star near the *following* edge 16th magnitude.

Lassell (*Mem. R.A.S.*, vol. xxiii. p. 60, Pl. II. fig. 5) describes it as a planetary nebula, and saw two stars in it.

The photograph leaves us in no doubt as to the character of the nebula. It is an annular nebula, as perfect in outline as M. 57 *Lyræ*, and is seen projected on a plane facing the eye and circular in form. The ring is most condensed on the *n.f.* side, but no distinct central nebulosity is shown, and there are three stars in the interior: the brightest of them (13th–14th magnitude) is near the centre; another, of about 16th magnitude, is on the *s.p.* side; and the third, which is below 16th magnitude, is almost involved in the ring on the *s.f.* side. There is also evidence of very faint condensations of nebulosity in the ring itself.

The nebula, as the photograph clearly shows, is either involved or else in alignment with the northern part of the cluster, which is a magnificent aggregation of stars between 9th and 16th magnitude, and the photo-fields around it are crowded with stars having the usual remarkable groupings, and numerous apparent double, triple, and multiple stars. Some years hence these rich photo-fields of stars and their groupings will afford delightful studies for our successors by the aid of photography.

Photograph of a "New" Spiral Nebula in Perseus. By Isaac Roberts, D.Sc., F.R.S.

The Spiral Nebula is in R.A. $2^{h}\ 29^{m}\ 58^{s}$, Dec. $38^{\circ}\ 31'{\cdot}4$ *north*, Epoch 1895. It is $3^{m}\ 51^{s}$ *preceding* and $5'{\cdot}4$ *south* of ♅ I. 156 *Persei*; both nebulæ are visible on the same photograph.

I assume this nebula to be new to science for the reasons that it is very faint, and is not recorded in the *New General Catalogue* or in the supplement to it, a manuscript copy of which Dr. Dreyer kindly sent me.

The convolutions of the spirals are very faint, but clearly visible on the negative, and involved in them are four 14–15 mag. stars and 6 or 7 stars, or star-like condensations, less bright than 16th mag. The convolutions are symmetrical, and proceed from a very faint star-like nucleus.

Photograph of the Nebula ♅ I. 156 Persei. By Isaac Roberts, D.Sc., F.R.S.

The photograph of the nebula ♅ I. 156 *Persei*, R.A. $2^{h}\ 33^{m}\ 49^{s}$, Dec. $38^{\circ}\ 36'{\cdot}8$ *north*, was taken with the 20-inch reflector on 1893 December 29, with exposure of the plate during three hours, an enlargement of which to the scale of 1 millimetre to 24 seconds of arc is now presented.

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The nebula is No. 1023 in the *New General Catalogue* and 575 in the *General Catalogue*.

It is described by Sir J. Herschel (*General Catalogue*, p. 56) as very bright, very large, very much extended, very very much brighter in the middle, lenticular, 5′ long. A drawing of it is given in the *Phil. Trans.* for 1833, Pl. XIV. fig. 56; but the nebula is drawn too pointed at the ends, and none of the stars involved in it are shown.

Lord Rosse in the *Phil. Trans.* for 1861, p. 713, Pl. XXV. fig. 5, and *Observations of Nebulæ and Clusters of Stars*, pp. 30, 31, records 13 observations of the nebula between the years 1850 and 1877. He saw 6 stars involved in it, and an oval nucleus; and about 20′ *preceding* the nebula saw a star of 8th or 9th mag. with what appeared to be an atmosphere round it.

The photograph shows the nebula with a distinct stellar nucleus and extensions of faint nebulosity in the *preceding* and *following* directions. On the *south following* side the faint nebulosity is seen to trend southwards, and suggests the idea that the nebula is either circular or an oval seen edgewise, the central star or nucleus being visible through the nebulosity in the direction of the semi-axis minor.

The nebula, as it is drawn by Lord Rosse in the *Phil. Trans.* for 1861, is in fair agreement with the photograph, and he shows five of the seven stars involved in it, and refers to having seen six stars. There is nothing about the 9th-magnitude star 20′ *preceding* the nebula, to which he refers, indicative of an atmosphere, as he suggests, nor does the star present any appearances differing from the other stars. The nebula is surrounded by very rich fields of faint stars, forming curves and festoons, such as are usually seen on all photographs taken with long exposures of the plates to the sky in the proximity of the Milky Way. Apparent *comites* and multiple stars are also numerous.

Admiral Smyth (*Cycle of Celestial Objects*, second edition, p. 67) states that he saw the nebula very distinctly with his instrument as an ellipse, and that it trends (as shown in his sketch, and also in Lord Rosse's sketch and drawing, and in Sir J. Herschel's drawing) in *north following* and *south preceding* directions at a position angle of about sixty degrees; but the photograph shows it to be just on a parallel of declination. It is difficult to reconcile this discrepancy upon the assumption of a change so large in the position angle of the major axis of the nebula within the interval of about eighteen years. On the other hand, it is difficult to realise that the three competent and independent observers named have each made so obvious an error in delineating the position angle.

If Admiral Smyth saw this very faint nebula as an ellipse, it is remarkable that he did not also see the stars involved in it, six of which were seen by Lord Rosse and are shown (seven in number) on the photograph, four of them being much brighter than the nebulosity.

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Notes on some Photographs taken with a Visual Telescope.

By H. F. Newall, M.A.

During the past six months several photographs of stars, &c., have been taken with the Newall telescope of the Cambridge Observatory with a view of testing the performance in photographic work of a large telescope constructed for visual work. I beg leave to show to the Society some of the results obtained.

These results may best be set forth if I describe the individual photographs exhibited, explaining at the same time the object aimed at in each attempt. The experiments have been made at considerable intervals, whenever, for some reason or another, spectroscopic work was not possible or convenient. Hence the information has been gathered slowly and under very varied conditions (as to temperature, &c.)

Some details are here given concerning the instrument, since a knowledge of them is necessary to a discussion of the images obtained:

Aperture of the object-glass	24·8 inches	630 mm.
Focal length	29 ft.	8844 mm.

Ratio focal length ÷ aperture = 14·04

The crown and flint lenses are separated only by the thickness of tinfoil.

Details concerning the colour correction of the object-glass:

	Inch.	Millimetre.	
[Hα (C)	− ·050	− 1 25 added April 23]	
Minimum between D and *b*	− ·159	− 4·04	Mean of 6 determinations made in course of 2 years with different slit spectroscopes by the Harkness-Vogel method.
Hβ (F)	·000	·000	Deduced from photographs of the spectrum of *Polaris* taken with objective prism in front of object-glass; aperture used 10½ inches.
Hγ (G′)	+ ·45	+ 11·4	
Hδ (*h*)	+ 1·07	+ 27·2	
Hε (H₁)	+ 1 50	+ 38·1	
Hζ (Huggins' α)	+ 2·25	+ 57·2	

Note.—Many slightly discrepant determinations have been made of the chromatic aberration in the red, yellow, and green. The sources of discrepancy are not yet perfectly clear, but there are indubitable signs of a temperature coefficient of considerable importance. The separation of minimum and Hβ foci given above is therefore to be regarded as provisional. In the appearance of star images on warm and cold nights the differences of the colour correction are quite noticeable in careful observation.

To facilitate comparison with other large refractors I append the following table: